referred to the Report of the Royal Commission on Secondary Education, and the remarkable unanimity with which it had been received by educationists. (For a criticism of the Report from the scientific side, see NATURE, vol. liii. p. 79.) The bodies for which he spoke approached the subject especially from the point of scientific and technical education of the country. It is an acknowledged fact that the higher technical education of the country suffers from the lack of suitable preparation in the secondary schools, and that little can be hoped for in the way of systematic and advanced technical instruction until a basis of secondary education, such as has long existed in continental countries, has been established. Fortunately this organisation, for which Sir Henry Roscoe pleaded on behalf of the deputation, is unaccompanied by many of the difficulties which surround the subject of primary education, and, therefore, in this case Parliamentary unanimity in securing the great benefits which such a secondary system would confer upon the country might be expected. No detailed statement was made as to the form which legislation should take, but Sir Henry Roscoe pointed out that the most important recommendations of the Royal Commission are, in the first place, the establishment of local authorities, consisting of not smaller areas than counties and county boroughs, and, in the second place, of a central authority, chiefly of an advisory character. After several other members of the deputation had spoken, the Duke of Devonshire said that the Government hoped to deal with the better organisation of secondary schools in the next session of Parliament. It is intended to follow, generally speaking, the lines which were indicated in the proposed measure of last year.

SOCIETIES AND ACADEMIES.

LONDON.

Physical Society, November 27.—Prof. Rücker, Vice-President, in the chair.—The President (Captain Abney) described and exhibited some apparatus for giving diagrams of the efficiency of a photographic shutter. In addition to the "speed" of a shutter, which is concerned with the interval (T) between the moments when the shutter admits the *first* and *last* rays of light, it is most important to know the efficiency of the shutter. The efficiency may be defined as follows: Let x represent the portion of the available aperture of the lens exposed by the shutter at a time t, and let X be the total available aperture. Then if the shutter were perfectly efficient, *i.e.* if the whole of the aperture were efficient during the time T, the quantity of light admitted would be proportional to XT. In other cases the quantity of light admitted will be proportional to $\int_0^T x dt$. Hence the efficiency is

$$\frac{\int_0^T x dt}{XT}.$$

The apparatus employed by the author consists of a slit placed near the shutter, so that the length of the slit is at right angles to the direction of motion of the shutter, and a lens by means of which an image of the slit is thrown on to a rotating drum or plate. The slit, when the shutter is open, is illuminated by the light of an arc lamp, a condensing lens being employed. In order to obtain a time scale two devices have been employed. In one of these a spoked wheel is rotated at a known speed so that each spoke, as it passes, momentarily cuts off the light. In the other arrangement a small lens, attached to the prong of a tuning-fork, throws a small spot of light on to the rotating drum, and thus gives a wavy line. Bromide paper or celloidin films are employed to record the diagrams. If the shutter were perfectly efficient, the diagram would consist of a rectangle crossed, if the rotating wheel is used, by a number of white lines, caused by the interruption of the light by the spokes of the wheel. These lines give a time scale by which the speed of the shutter can be calculated. The author showed a number of diagrams taken by the apparatus and illustrating the behaviour of different shutters under varying conditions. In one of these the rebound of the shutter at quick speeds is clearly shown by each of the principal diagrams being followed by a small auxiliary one. Prof. Perry said he supposed that what was required was some method of showing the *motion* of the shutter. Mr. Boys suggested that the efficiency might be defined as the ratio of the area of the actual diagram to that of the rectangle having as base the time between the commencement and end of the exposure. Mr. Inwards asked if the author had made any experiments to determine the amount of shake communicated to the camera by the motion of the shutter. Prof. Perry said what was required was an exceedingly light shutter that got up a great speed before it reached the aperture. The author, in his reply, said he had investigated the question of the shake due to the movement of the shutter. He considered that the amount of this shake depended upon the extent of the movement of the centre of gravity of the shutter. With a small stop the Thornton-Pickard shutter fulfilled Prof. Perry's requirements. The experiments have shown that the exposure does not always vary as the square of the aperture, on account of the small efficiency of some shutters for oblique rays. Thus in one case, by doubling the aperture, you only increase the light threefold.

Royal Meteorological Society, November, 18.—Mr. E. Mawley, President, in the chair.—Mr. W. Ellis, F.R.S., gave an account of the Proceedings of the recent International Meteorological Conference, which was held at Paris, from September 17 to 23.—The Hon. F. A. Rollo Russell read a paper on haze, fog and visibility. Haze is most prevalent when the wind is from the north-east, and is due probably to excess of dust brought about by conflicting currents. The causes of fog are to a great extent the same as the causes of haze, although radiation in certain states of the air and ground plays a more conspicuous part. The main cause of fog is mixture of airs of different temperatures; and the attainment of a size of water particle so much larger than in the case of haze is due to suddenness of mixture, greater humidity, or greater differences of temperature. The conditions favourable to visibility are dryness of the air near the ground level, uniformity of temperature and moisture, radiation below the mean, steady and homogeneous winds through a great depth of the atmosphere, approximation of the temperatures of sea and land, and a number of dust particles less than the mean.

PARIS.

Academy of Sciences, November 23.—M. A. Cornu in the chair.—On some properties of uranic rays, by M. H. Becquerel. The rays emitted by uranium and its salts have some properties in common with the X-rays, but differ from them in being reflected and refracted like light. Even after eight months in complete obscurity, this radiation from uranium and its salts remains unchanged. The property of discharging an electrified body, which is communicated to a gas by exposure to the X-rays, or by transmitting electric sparks through it, is also possessed by air which has passed over uranium in the dark.—Decimalisation of the hour, by M. Bouquet de la Grye.—Theoretical study on the pitching of submarine vessels, by M. Leflaive. An investigation of the relations between the displacement, speed, and depth under water; the pitching is also studied, and the results displayed graphically.—On a particular case of the motion of liquids, by M. E. Fontaneau.—Euclid's postulate, considered as a property of three-dimension space, by M. G. Morosov.—Observations on the new Perrine Comet (1896, November 2) made at the Observatory of Algiers, by MM. Rambaud and Sy.—On algebraic curves of constant torsion, by M. Eugène Fabry.—On an application of the theory of continued groups to the study of the singular points of linear differential equations, by M. F. Marotte.—On the singularities of the equations of dynamics, and on the problem of three bodies, by M. P. Painlevé.—On the movement of a solid in an infinite liquid, by M. R. Liouville.—On the distribution of deformations in metals submitted to stresses, by M. George Charpy. A continuation of the discussion with M. Hartmann.—Discharges by the Röntgen rays; influence of temperature and pressure, by M. Jean Perrin. It is found that for the same gas, at a constant temperature the quantity of electricity lost per unit mass of gas is independent of the pressure, and proportional to the absolute temperature. It is noteworthy that according to the kinetic theory of gases the energy possessed by a molecule is also independent of the pressure and proportional to the absolute temperature.—Illusions which accompany the formation of penumbra, and applications of these to the X-rays, by M. G. Sagnac. No conclusions can be drawn from any peculiarities exhibited by shadows, without taking into account the extent and form of the source, the relative lustre of its different points, the form and position of the opaque body, and the photometric properties of the retina or photographic plate. The precaution should always be taken of replacing the Röntgen tube, in any

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given experiment, by a luminous source emitting ordinary light, and of a shape and lustre as nearly similar as possible to the Crookes' tube.—Action of some hydrogen compounds upon thionyl chlorides, by M. A. Besson. With hydrogen iodide complete decomposition occurs, with formation of hydrogen chloride, iodine, sulphur dioxide, and sulphur. With hydrogen sulphide in a freezing mixture of ice and salt the main reaction is

$$2SOCl_2 + 2H_2S = 4HCl + SO_2 + 3S,$$

but a little S_2Cl_2 is formed in a secondary reaction, especially if the temperature is allowed to rise. Hydrogen phosphide gives hydrogen chloride, and a mixture of P_4S_3, phosphorus, $POCl_3$ and $PSCl_3$.—On the neutral crystallised chromite of magnesium, by Em. Dufau.—The salts of hexamethylene, by M. Marcel Delépine. Measurements of the heat of neutralisation by hydrochloric, sulphuric, nitric, and oxalic acids, and the heat of solution of the hydrochloride, the three sulphates, and two nitrates.—The function of boric acid in glasses and enamels, by M. L. Grenet. An experimental study of the relation between the quantity of boric acid in a glass and its coefficient of expansion.—On the non-retractile blood clot; suppression of the formation of blood serum in some pathological states, by M. G. Hayem.—Research on caramel in wines. Possible confusion with coal-tar colours, by M. A. J. da Cruz Magalhaês.—On the osmotic pressure in germinating grains, by M. L. Maquenne. The osmotic pressure was determined indirectly by taking the freezing points of the expressed juices. The values found in some cases approached ten atmospheres.—On the Elasipoda collected by the *Travailleur* and *Talisman*, by M. Rémy Perrier.—On compound nucleoles, especially in the egg of the Annelida, by M. Auguste Michel.—On the development of the "Black Rot" in the vine, by M. P. Viala.—On the development of a fungus in a liquid in motion, by M. Julien Ray.—Geological researches in the Central Caucasus, by M. Vénukoff.

DIARY OF SOCIETIES.

THURSDAY, DECEMBER 3.

LINNEAN SOCIETY, at 8.—Does Natural Selection play any part in the Origin of Species among Plants: Rev. Geo. Henslow.

CHEMICAL SOCIETY, at 8.—Election of Fellows.—Constitution and Colour: Arthur G. Green.—Some Experiments on Sea-water: E. Sonstadt.—Derivatives of α-Hydrindone: C. Revis and Dr. F. S. Kipping.—Notes on Nitration: Dr. H. E. Armstrong.—2 : 3′ Bromobetanaphthol: Dr. H. E. Armstrong and W. A. Davis.—Derivatives of Nitrobetanaphthols: W. A. Davis.—Morphotropic Relations of Betanaphthol Derivatives: W. A. Davis.—Researches on Tertiary Benzenoid Amines: Miss C. Evans.

FRIDAY, DECEMBER 4.

GEOLOGISTS' ASSOCIATION, at 8.—The Foraminifera of the Thanet Beds of Pegwell Bay: H. W. Burrows and Richard Holland.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Address by J. Wolfe Barry, C.B., F.R.S. (President).—Railway Signalling: David W. Kinmont.

SUNDAY, DECEMBER 6.

SUNDAY LECTURE SOCIETY (St. George's Hall), at 4.—New Zealand—the World's Wonderland: W. Herbert-Jones.

MONDAY, DECEMBER 7.

SOCIETY OF ARTS, at 8.—The Use of Gas for Domestic Lighting: Prof. Vivian B. Lewes.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—A Journey to the Sources of the Niger: Colonel J. K. Trotter.

SOCIETY OF CHEMICAL INDUSTRY, at 8.—The Alkali Manufacture: An Historical Sketch: Alfred E. Fletcher.—Notes on the Spontaneous Oxidation of Aluminium in contact with Mercury: H. F. Hunt and L. J. Steele.

VICTORIA INSTITUTE, at 4.30.

TUESDAY, DECEMBER 8.

ANTHROPOLOGICAL INSTITUTE, at 8.30.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Tipping and Screening Coal: James Rigg.—The Surface Plant at Kirkby Colliery: Thos. Gillott.

ROYAL PHOTOGRAPHIC SOCIETY, at 8.—Dr. Selle's Process for Natural-Colour Photography: Dr. Neuhaus.

WEDNESDAY, DECEMBER 9.

SOCIETY OF ARTS, at 8.—Mining at Great Depths: Bennett H. Brough.

SANITARY INSTITUTE, at 8.—Soils and their Suitability for Sewage Farms, with the *rôle* of Bacteria in Sewage Disposal: Dr. Samuel Rideal.

THURSDAY, DECEMBER 10.

ROYAL SOCIETY, at 4.30.—On Prof. Hermann's Theory of the Capillary Electrometer: G. J. Burch.—An Attempt to determine the Adiabatic Relations of Ethyl Oxide: E. P. Perman, Prof. Ramsay, F.R.S., and J. Rose-Innes.—Experiments in Examination of the Peripheral Distribution of the Fibres of the Posterior Roots of some Spinal Nerves, Part II.: Prof. Sherrington, F.R.S.

MATHEMATICAL SOCIETY, at 8.—A Discovery in the Theory of Compound *Denumeration*: Prof. Sylvester, F.R.S.—On the Stationary Motion of a System of Molecules having Finite Dimensions: S. H. Burbury, F.R.S.—Concerning the Abstract Groups of Order K! and ½ K! Holoedrically Isomorphic with the Symmetric and the Alternating Substitution Groups on K Letters: Prof. E. H. Moore.—On the Influences of Viscosity on Waves and Currents: S. S. Hough.—On a Series of Co-trinodal Quartics: H. M. Taylor and W. H. Blythe.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Annual General Meeting.

SOUTH LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY, at 8.—Notes on the North American Agrotis subgothica: W. Mansbridge.

FRIDAY, DECEMBER 11.

PHYSICAL SOCIETY, at 5.—The Application of Physics and Mathematics to Seismology: Dr. C. Chree.—On Musical Tubes: R. J. Rudd.

ROYAL ASTRONOMICAL SOCIETY, at 8.

BOOKS AND SERIALS RECEIVED.

BOOKS.—Autobiographical Sketch of James Croll, with Memoir of his Life and Work: J. Campbell Irons (Stanford).—The Aurora Borealis: A. Angot, translated (K. Paul).—Navigation, Practical and Theoretical: D. Wilson-Barker and W. Allingham (Griffin).—Practical Electricity: Prof. Ayrton, Vol. 1, new edition (Cassell).—The Exploration of the Caucasus: D. W. Freshfield, 2 Vols (Arnold).—Twenty-fourth Annual Report of the Local Government Board. Supplement in continuation of the Report of the Medical Officer for 1894–5, on Oyster Culture in relation to Disease (Eyre and Spottiswoode).—The Russian Fur-Seal Islands: L. Stejneger (Washington).—Bicycles and Tricycles: A. Sharp (Longmans).—A History of Elementary Mathematics: Prof. F. Cajori (Macmillan).—Motive Power and Gearing for Electrical Machinery: E. T. Carter (*Electrician* Company).—Crags and Craters: W. D. Oliver (Longmans).—Fur and Feather Series. Red Deer: Macpherson; Cameron of Lochiel: Viscount Ebrington and Shand (Longmans).—Pocket Atlas of the World: J. G. Bartholomew, 10th edition (Walker).—Manual of Determinative Mineralogy, &c.: G. J. Brush, revised and enlarged by Prof. Penfield (Chapman).—Guttersnipes: Phil May (Leadenhall Press).—The Struggle of the Nations—Egypt, Syria, and Assyria; G. Maspero, translated by M. L. McClure (S.P.C.K.).

SERIALS.—English Illustrated Magazine, Christmas (198 Strand).—Longman's Magazine, December (Longmans).—Chambers's Journal, December (Chambers).—Lloyd's Natural History. Mammals: R. Lydekker, Part 3; Monkeys: Dr. H. O. Forbes, Part 3 (Lloyd).—Memoirs and Proceedings of the Manchester Literary and Philosophical Society, 1896–97, Vol. 41, Part 1 (Manchester).—Journal of the Anthropological Institute, November (K. Paul).—Good Words, December and Christmas (Isbister).—Sunday Magazine, December and Christmas (Isbister).—Natural Science, December (Page).—History of Mankind: F. Ratzel, translated, Part 14 (Macmillan).—National Review, December (Arnold).—Humanitarian, December (Hutchinson).—Contemporary Review, December (Isbister).—Physical Review, (November–December (Macmillan).—Century Magazine, December (Macmillan).—Scribner's Magazine, December (Low).

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